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WORLD VISION

PROJECT:
INTEGRATED MANAGEMENT OF 5 WATERSHEDS
MUNICIPALITIES OF JUJUTLA & GUAYMANGO DEPT. OF AHUACHAPAN

GRANT Nº 519-A-00-99-00210-00

FINAL REPORT OF ACTIVITIES
September 1999- December 2002
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Submitted To:
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GENERAL CONSIDERATIONS

El Salvador with a territorial extension of approximately 20,700 km2 and a population of 6 million inhabitants, with an accelerated growth rhythm demands day after day greater quantities of food, energy producing materials and water.

The process of environmental deterioration that is being experienced is becoming more evident which results in a negative incidence in the quality of life of our population.

In fact several present manifestations of the growing loss of quality of life of the Salvadorans are related to the degradation of our eco-systems thus increasing the respiratory and gastro- intestinal diseases, greater presence of epidemics, increase in the level of decease propagation of plagues and viruses; Also a high level of stress and violence due to poverty conditions.

The high levels of erosion and loss of quality of the soil are seriously compromising the productive capacity of our. Water and energy are becoming scarce and more expensive reason why they are becoming a serious obstacle for the development of productive activities.

To benefit productive development a radical change is required related to soil, air and water. In this manner the project Integrated Management of Five Water Producing Micro watersheds in the municipalities Jujutla and Guaymango, Department of Ahuachapan contributed in the restoration and conservation of the natural resources with a special emphasis on water.

Executive Summary

The Project Integrated Management of Five Water Producing Micro watersheds in the municipalities Jujutla and Guaymango, Department of Ahuachapan had a duration of three years beginning in 1999 and ending in the year 2002.

The main emphasis of the project was to improve the quality and access to potable water of the population in the five micro watersheds, as well as incorporating basic grain farmers planting in slopes and with limited resources in a sustainable agricultural system in harmony with the environment.

The focus of the work was based on the integrated handling of the five micro watersheds developing communities in the adoption of conservationist practices for the reduction of the degradation of the natural resources.

The project during its execution counted with financial and technical support from the Agency for International Development of the United States, USAID, and was executed by World Vision. The development of the planned activities was possible thanks to team work with the farmers, community leaders, promoters-farmers as well as municipal governments, Community Associations, CENTA, schools and Health Units.

We can emphasize the following achievements as a product of the work:
The integrated handling of five micro-watersheds in the southern portion of the Department of Ahuachapan, two water systems were built benefiting a total of 400 families in two micro-watersheds. In each one of these micro-

watersheds water committees were organized and trained which assumed the administration of the systems. Two hundred fifty-six improved stoves Finlandia type and 103 fertilizing latrines were built; also environmental cleaning activities were performed such as: "Abate" distribution and fumigation to control the mosquito that transmit dengue, distribution of Puriagua for the treatment of water for human consumption and cleaning campaigns. Environmental education was provided to 300 students and teachers of five schools and a total of 167,000 forest trees were produced and planted.

Work was performed to improve 300 farms and an equal number of farmers in which soil and water conservation works were built such as: planting of 36 thousand pineapple seedlings, construction of 16 thousand meters of slope drainage channels, establishment of 43 thousand meters of live barriers of vetiver grass. Additionally 14 thousand citric trees were planted and 80 house gardens were established with an equal number of women. To perform the agricultural extension work 25 leaders were selected and trained that functioned as promoter farmers. The training areas were micro-watershed handling, soil and water conservation and organic agriculture.

Finally with the purpose of measuring the adoption level of the techniques a study for the calculation of the acceptability index was performed with purpose of measuring the adoption level of the implemented technologies. An intermediate evaluation of the project was also performed and at the end of this document the results and lessons learned are presented.

DETAIL ON THE EXECUTED ACTIVITIES BY OBJECTIVE

OBJECTIVE 1: PRODUCE WATER IN SUFFICIENT QUANTITY AND WITH THE REQUIRED QUALITY FOR HUMAN CONSUMPTION.

Performed activities
Below the performed activities during the life of the project are described.

A. Training of Leaders (Men and Women) in the Integrated Handling of Micro-watersheds

A total of 25 leaders in the five micro watersheds that supported the project were trained in Integrated Handling of Micro-watersheds. During three years the people received theoretical training on micro-watersheds, their handling and limits establishment. The leaders had an opportunity to visit the work that each one of the micro-watersheds was performing. It was enabled by the 5 field visits that were performed in order to demonstrate the results in each zone.

Other subjects on which the leaders were trained are included: community organization with a base in the Micro-watershed, resource management, preparation of project profiles etc. The trained people are now part of the Environmental Dialogue table of the Southern Part of the Department of Ahuachapan. In this table the problems and future actions to be performed in order to improve the living conditions of the inhabitants of the micro watersheds are confronted.

B. Construction of 256 Improved Stoves Finlandia Type

With the purpose of reducing forest tree cutting thru the reduction of wood consumption for cooking the construction of improved wood saving Finlandia type stoves were built. 256 stoves were built to benefit an equal number of families. The methodology consisted of the hiring of two women with experience in the construction of the stoves who would in turn teach each

family how to build their own stove. The project provided the technical assistance and also the materials to build them.

The benefits of owning an improved stove are: a 50% reduction in the consumption of wood, which reduces tree cutting and wood gathering time, chore that generally is performed by women, boys and girls. The stove is equipped with a chimney that allows maintaining the site free of smoke thus reducing the respiratory and eye problems.

Photo: Improved Stove Finlandia Type

C. Construction of 103 Dry Fertilizing Latrines

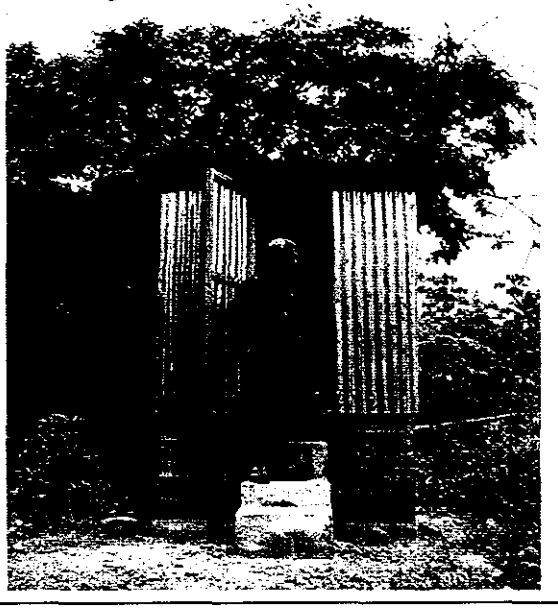
During the three years of the project a total of 103 fertilizing latrines were built with the purpose of reducing environmental contamination by feces. The latrines were built with the labor of the beneficiaries supported by masonry workers specialized in the construction of these types of latrines. The project provided the materials and technical assistance for the construction of the latrines.

The beneficiary families were selected based on the following criteria: living in the area of influence of a water source, living in the recharge area or the middle portion of the micro-watershed and not owning any type of latrine.

The latrine beneficiaries received two trainings on handling and maintenance of latrines; also received periodic visits form the project personnel to verify the adequate use and handling.

The fertilizing latrines have the advantage of preventing the contamination of the water table by feces and urine, containing two water proof compartments that allow for the safe disposal of feces so they can later be used as organic fertilizer (hence the name Fertilizing Latrine)

Photo: Fertilizing latrine located in the recharge area of the Micro-watershed

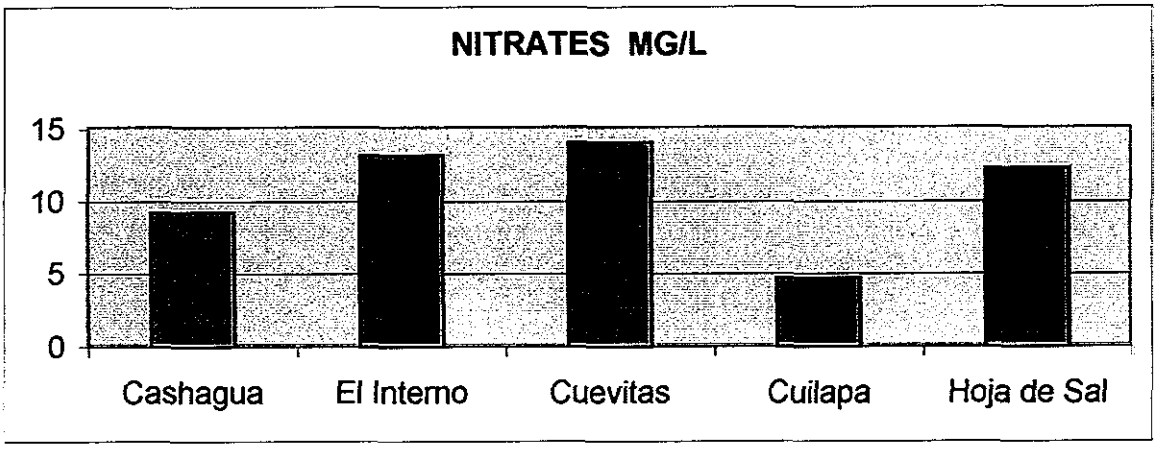


D. Laboratory Analysis to determine water quality

With the purpose of measuring the water quality of the water sources from which the communities obtain the water they consume, during the three years a series of lab analysis were performed. The analysis determines the biological and chemical characteristics of the water. For an improved representation samples were collected from the high, middle and lower portions of the micro-watershed. The results shown in the following chart are the ones from the last analysis performed during the year 2002 which determine the quality of the water at the end of the project.

Micro-watershed	Nitrates mg/l	E. coli	Coli forms	Total Bacteria
Cashagua	9.24	3,000	129,666	256,333
El Interno	13.20	366	9,366	68,500
Cuevitas	14.08	4,066	25,000	71,000
Cuilapa	4.69	1,666	45,333	120,333
Hoja de Sal	12.32	2,333	12,666	47,666

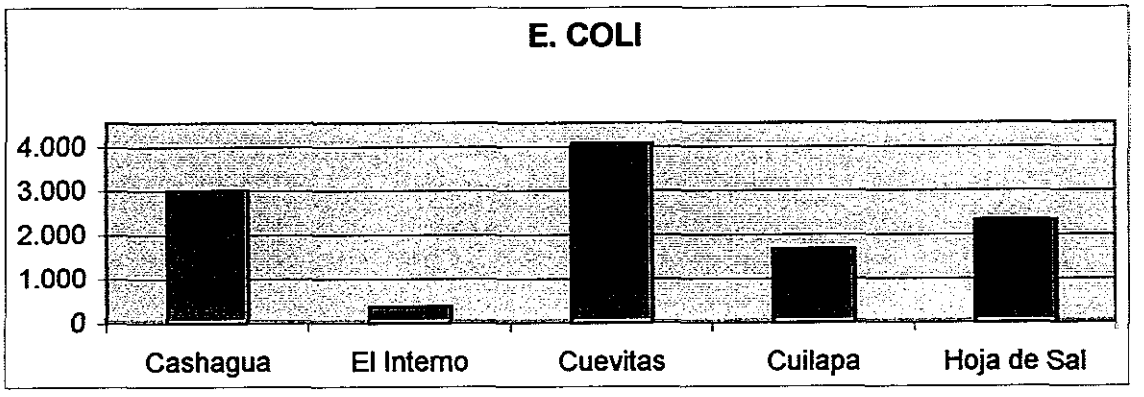
Graph 1: Laboratory Results as related to nitrates in the water



According to the World Health Organization (WHO) the allowable nitrate levels in water should be below 45 mg/l. This means that all the sources have values inferior to the standard, which make them suitable for human consumption. The communities Cashagua and Cuilapa show the lowest values (9.24, 4.69 respectively); Cuevitas and El Interno and Hoja de Sal the highest (14.08,13.20 y 12.32).

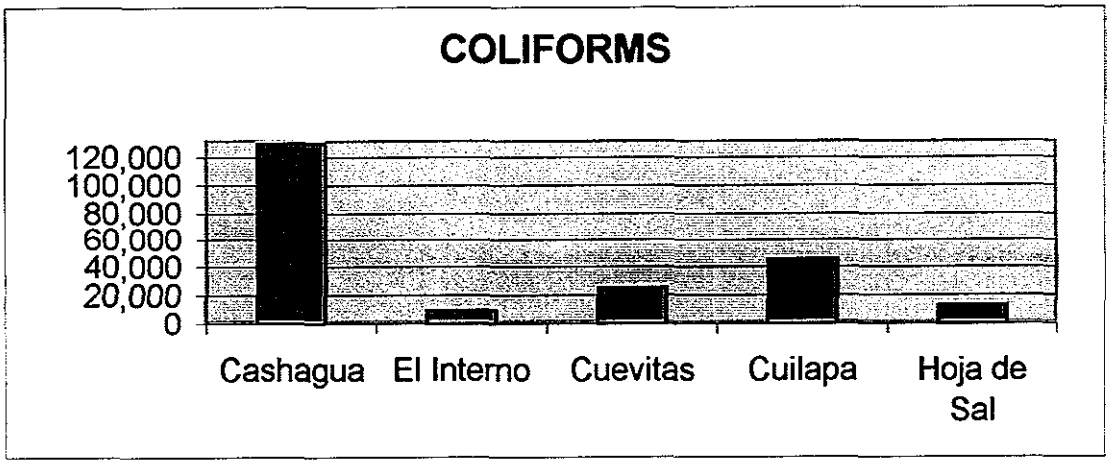
The elevated levels of nitrates are an indication that the water could be contaminated by sewer water as well as the use of nitrogenated fertilizers in the recharge zone. The effects that it produces in the environment are the acceleration of Eutrophication, which causes coloring in the water, and the growth of algae. In human beings it produces, in children, the disease called Metahemoglobinemia or blue babies; in adult's heart and cancer problems.

Graph 2: Number of E. Coli contained in the water (UFC/100 ml)



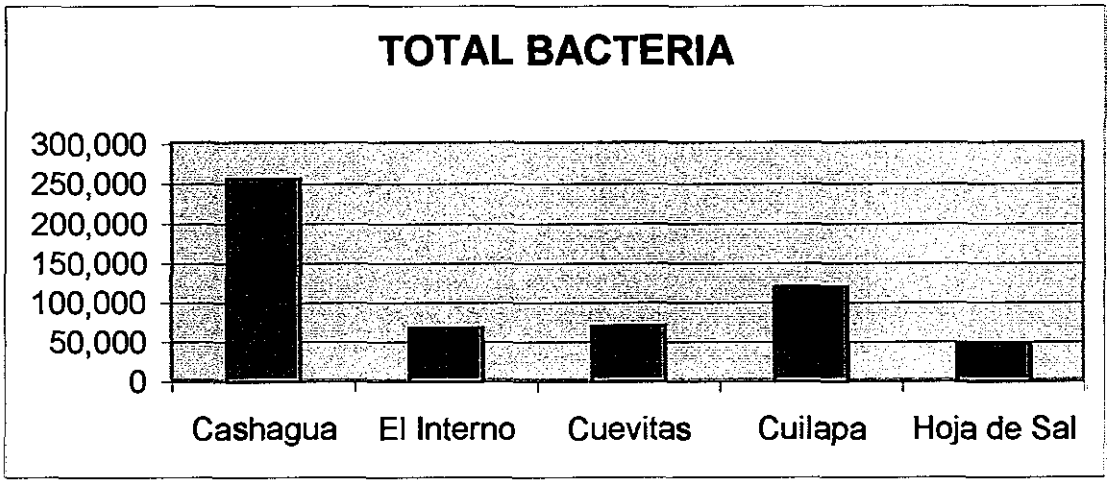
For water to be adequate for human consumption the desired level of E. Coli is a value of Zero. This value can only be reached providing a *disinfection* treatment. The lab analysis show that micro watershed El Interno is the one with the lowest level of E. Coli (366), followed by Cuilapa (1,666), Hoja de Sal (2,333), Cashagua (3,000) and Cuevitas (4,066). It is noteworthy that the sample collected in the high portion of the Cuilapa micro-watershed is Zero. This is due to the construction of a water system that has a chlorinator. This proves that the water disinfection using chlorine is effective for bacteria control.

Graph 3: Number of Coli forms reported in lab analysis (UFC/100ml)



In relation to the number of coli forms the micro-watersheds that have the lowest number are: El Interno and Hoja de Sal; and the greatest number are: Cashagua, Cuevitas and Cuilapa.

Graph 4: Total bacteria count (UFC/100 ml)



In relation to the total number of bacteria the micro-watersheds with the lowest number are: Hoja de Sal, Cuevitas and El Interno. The ones with the greatest number are: Cashagua and Cuilapa.

In conclusion we can say that the low level of nitrates in the water of the micro-watersheds make it suitable for human consumption. However it is necessary to use some method of water disinfection, like the application of Puriagua to lower the total levels of E. coli, coli forms and bacteria.

E. Presentation of the Health Base Line to Water Committees and other Agencies

With the purpose of getting to know the health conditions of the micro watersheds in which the project is being executed a Base Line study was performed. In it all the environmental factors that can generate health problems to people were taken into consideration for example: The treatment that people give to water for consumption, garbage treatment, where to they carry out their physiological needs, where do they bathe, what type of stove do they have, and others. The results of this study were used to reorient the actions of the project in such a way that the most critical problems were countered.

With the purpose of socializing the results of the Base Line a workshop was held in Sonsonate, where Bachelor Luis Aquino consultant that was in charge of the investigation revealed its results. Twenty members of the water committees were present as well as ten others from the following Organizations: Salvanatura, Ministry of Agriculture, Health Units of Jujutla and Guaymango and employees of the departmental health system.

In the workshop aside from revealing the results time was dedicated to interact with the participants and look for mechanisms of cooperation between the different actors in order to resolve the health problems associated with the inadequate handling of the environment. A copy of the Base Line Study was sent to USAID as evidence that the investigation was performed.

F. Construction of Two Water Systems in the Micro-watersheds Cuilapa and Hoja de Sal

During the life of the project two potable water systems were built with a filling facility for containers in the Cuilapa and Hoja de Sal Communities, Municipality of Jujutla, Department of Ahuachapan. In the following table the components of each one of the systems are described:

Accessories	Cuilapa	Hoja de Sal	Total
Spring Protection	1	1	2
Water storage tank	1	1	2
Water chlorinator	1	1	2
Kilometers of pipe	3	1.5	4.5
Water Filling Facilities	9	7	16
Public Washing Facilities	6	10	16
Oxidation Pits	3	1	4

For the construction of the systems the communities supplied the water springs and dug the ditches for the installation of the pipes.

The systems benefit around 400 families that supply themselves with this water for human consumption and for clothes washing. The system for the treatment of soapy water thru an oxidation tank guarantees that the environment will not be contaminated by served waters that result from the washing facilities since they receive treatment before being filtered into the subsoil. A chlorine dispenser was installed in the water storage tank so the water that reaches the filling facilities is already purified and thus guarantees that the families drink healthy water, free of pathogen microorganisms.

This type of infrastructure contributes to meeting the project objective "Water", since it guarantees the constant and adequate supply of clean water to the families in the community.

Also the infrastructure has been handed over to the Water and Cleaning Committees, which were formed with the purpose of administrating the systems.

Photo: Filling Facility in the Community Hoja de Sal, Municipality of Jujutla

G. Preparation of Community Health Plans

With the purpose of looking for greater protagonism from the community leaders of the five Water Producing Micro-watersheds, work was done with the different committees in the forging of the Health Plans. The plans were focused mainly to the resolving of the health problems that the inhabitants of the Micro-watersheds suffer caused by the inadequate handling of the environment mainly water.

The employed methodology was to initially prepare with the community a Risk map and then to proceed into their problem tree. Later possible solutions were researched which could provide an answer for each one of the identified problems. Finally a document was drafted called Health Plans which was given follow-up during the whole life of the project.

Within the main problems that The Micro-watershed committees identified are: Bad disposal of feces, Water contamination, air contamination, vector proliferation like flies and mosquitoes, malnutrition, parasites and others.

H. Training to the Members of the Water Boards in Basic Environmental Cleaning

With the purpose of improving the Knowledge of the Water Board Members training were provided on the subjects of healthy water, solid waste, garbage handling and handling of residue waters.

In the training of Healthy Water a total of 54 people participated members of the five Water boards. The participants received information on the diseases that consumption of contaminated water produces as well as instruction on the chlorination method of water using Puriagua.

Puriagua is a liquid solution based on chlorine that the Ministry of Health puts at the disposal of the communities. Finally a demonstration of the water purity was made after it was treated with chlorine utilizing a simple apparatus, which by the use of colors determines the water quality.

In the training on Solid Waste and Garbage Handling, a total of 56 people participated. In the training a couple of videos were shown on Solid Waste so they could later reflect on 'What is garbage?' Methods to classify and reutilize garbage were a taught as well as recycling and compost.

In the training on Handling of Residue Water, 52 people participated and they were shown a video on the subject. The different types of sumps that exist for residue water and their construction methods were taught.

These trainings were provided to 229 inhabitants of the five Micro-watersheds. Each training lasted one day and was taught by Doctor Susana Calderon, professional in the area of Public Health in coordination with the environmental cleaning inspector of the Ministry of Health.

I. Basic Environmental Cleaning Actions

With the purpose of improving environmental and health conditions of the five Micro-watersheds inhabitants covered by the project the following actions were performed:

- ABATE Distribution. This product is utilized for the control of the larva for mosquitoes and that cause deceases like Malaria

and Dengue. The Abate was donated by the Ministry of Health and Public Assistance. The population received the product plus training on the use of the chemical as well as complementary measures to avoid the proliferation of mosquitoes.

- Journeys for the Fumigation of Homes. A total of 3 fumigation campaigns were performed in the five Micro-watershed covered by the project. The fumigations served for vector control of disease transmitters like adult mosquitoes, flies, roaches and others. These fumigations were performed in coordination with the ministry of Health. The Ministry provided the chemical and the fumigation pumps. The project provided fuel for the pumps and the transportation of the Health Ministry's equipment and personnel.

  The fumigations had great impact on the population since the number of disease transmitting vectors was significantly reduced; proof is in the fact that during this period no cases of Dengue or malaria were reported in the fumigated areas.
- Puriagua Distribution. Puriagua was handed out in each one of the micro watersheds in order to allow the families to have access to the chemical to purify water for consumption. The distribution was made thru the storage centers installed in each Micro-watershed. Puriagua was supplied free of charge by the Ministry of Health and Social Assistance.
- Talks to Farmers on Safe Handling of Chemicals for Agriculture. In coordination with the National Center for Agricultural Technology CENTA, talks were provided to the farmers on the safe handling of chemicals for agriculture. They were taught how to manufacture protection equipment (mask, goggles, gloves and apron) utilizing common and low cost materials. This activity is important, since in the rainy season a greater number of people are intoxicated due to mishandling of agricultural chemicals. On the other hand the contamination of water by agricultural chemicals is prevented due to bad practices from the farmers, mainly in the washing of the fumigation pumps in the rivers.
- **Cleaning campaigns in the micro-watersheds.** Cleaning campaigns were performed in the five micro-watersheds covered by the project. During the campaigns teachers, students and the rest of the community participated. The objective of the campaigns was to eliminate garbage that is found dispersed throughout the communities and eliminate objects that are useless, retain water and can serve as breeding ground for vectors. The collected garbage was separated into organic and inorganic, the inorganic garbage was buried. The organic garbage was used after it was

decomposed in the plots as organic fertilizer. This action contributes to rid of the communities of garbage that can contaminate the water in the springs and rivers. Also by maintaining the Micro-watersheds free of garbage the risk of a proliferation of vectors like the mosquito that transmits dengue is reduced.

The attached photograph shows one of the pits that each family has built to bury garbage. They have a pit for organic garbage and another for inorganic garbage.

Photo: Pit for garbage disposal in the home of one of the farmers served by the project

J. Environmental Education of boys, girls and teachers in five schools of the Micro-watersheds.

As part of the conscience building program of the different sectors of the population of the micro-watersheds a series of 8 training modules on environmental cleaning were held directed toward 300 boys, girls and teachers. The modules shared were the following:

- The Home of the Water
- The Faucets that Irrigate the Land
- Living with Nature
- The Enemy of Water

- Don't throw it away nor get it Dirty
- A Hand for the Environment
- The Environment and my Health
- Environmental Education in School

These materials have been produced by the Ministry of the Environment and are of high quality for the environmental education of boys and girls in the communities. A specialized professional taught the modules. The teaching was implemented in an interactive manner where the boys and girls learned in an interesting and dynamic manner. After each module homework was given to be performed in the community or at their home for example the execution of the cleaning campaigns, water chlorination and garbage recyling. The purpose of these activities was so the participants could have an opportunity to put into practice what they had learned and in this manner contribute to the improvement of water production and its quality.

Another purpose of the trainings was to create new values in boys and girls so they can adopt better practices in life that are less degrading for the environment and to create a more sustainable development for the Micro-watersheds.

The trainings of the students and teachers were accompanied by field tours in the Micro-watersheds with the purpose of having the students familiarize themselves with their surroundings and to become conscious of the environmental problem so they can be part of the solutions. An opportunity to visit the plots of the farmers served by the project and to practice some of the technologies that are being used like the construction of slope drainage ditches, live barriers, fruit tree planting and others.

The program ended in the year 2002 with an event called the *Water Festival*, which consisted of having the participating children showing what they had learned, and their acquired conscience during the training process of the modules. The students showed their capacity through artistic expressions like singing, painting and poetry. The best groups were given recognition.

The environmental education contributed to meeting the objectives in the sense that new generations were trained in environmental agricultural components, which in the near future will allow them to adopt new agricultural technologies that are less degrading for the environment.

K. Production of 167,000 Plants in community nurseries.

A total of 167,000 plants were produced in the five Micro watersheds of the project. To initiate production of plants in the communities training was held

"Establishment and Handling of Nurseries" in which 50 farmers participated that were in charge of handling the community nurseries.

The variety of plants include fruit and forest trees like: cashew, Indian mango, avocado, leucaena, madre cacao, eucaliptus, teca, paterna, nacaspiro, ingas, cedar, laurel and others. Some of the species are native to the area and are in danger of extinction; other species are promising and of multiple uses producing firewood, timber and organic fertilizers.

The purpose of producing plants at a local level was so people could learn the techniques for reproduction and in the future they will not depend only on external sources of plant supply, they will be capable of producing them. The plants were used for the reforestation of the recharge areas of the Micro-watersheds and to increase the forest cover, increase the water infiltration capacity and to increase the recharge of the aquifers.

Photo: Community nursery with fruit and forest species

OBJECTIVE 2: 100% OF THE FARMERS WILL ADOPT A MINIMUM OF 7 APPROPRIATE FARMING TECHNOLOGIES IN THEIR DEMONSTRATION PLOTS

A. Training of the farmers Promoters

A farmer promoter is a farmer that has leadership qualities and that has been trained in order to be able to provide technical assistance to the rest of the farmers in the vicinity of his community.

During the life of the project different activities were performed geared toward training 25 Farmers Promoters that work in agricultural communication chores in the project on a voluntary manner.

The trainings provided for the promoter's farmers were on the subject of production of vegetables under organic conditions, use of micro irrigation systems, integrated handling of Micro-watersheds, construction of conservation works for soil and water, agro forestry, safe handling of agricultural chemicals, handling of fruit and forestry plantations and others.

The farmer promoters received training on a periodical basis in such a manner that they could achieve a good technical level that would allow them to provide technical assistance to the rest of the farmers in their communities. Each promoter farmer covered an average of 15 farmers in his community.

This extension strategy is utilized expecting that it allows providing sustainability to the processes even when the project has finished.

B. Workshop for Integrated Handling of Watersheds.

During the period of the 25 to the 27 of July 2001 a workshop named "*Integrated Handling of Watersheds*" was held. The workshop was provided to the technicians of the organizations that work in the southern portion of the Department of Ahuachapan. The purpose of the workshop was to strengthen the knowledge on Integrated handling of Watersheds so these can be applied in the actions that each one of the agencies performs. The workshop was taught by the international consultant PhD. Jorge Faustino, expert in the matter of Watersheds. The subjects covered are shown below:

- Review of the Basic Concepts of Watersheds
- Management Process for the Handling of Watersheds
- Key aspects for Implementing project or activities in the Handling of Watersheds

- Monitoring and sustainability of the actions of Watershed Management

The methodology employed by the facilitator of the course was: conferences, work in groups and field visits. In relation to the last a field visit of one of the project Micro-watersheds was carried out in order to be able to identify the problems in the Micro-watershed, its potentials and possible key actions.

30 technicians attended the workshop from the following agencies: CARE, Salvanatura, ÁGAPE, Ministry of Agriculture, Ministry of Health and project personnel from WORLD VISION.

The workshop was useful for every participant since it allowed them to update their knowledge and experience on the subject. It also provided an opportunity of achieving a greater integration among all the organizations that work in the area.

One of the sectors that have shown greater protagonism lately in the actions toward Environmental Cleaning is the Ministry of Public Health and social assistance, through the departmental health organization and the Health Units coordinate with the project the actions that tend to improve the environmental and health conditions of the people that inhabit the Micro-watersheds.

C. Trainings on soil and water conservation

During the three years that the feedback trainings were performed on the different techniques of soil conservation and fertility. The provided trainings consisted of:

- Use of an "A" type level, to chart the level of the curves
- Construction of slope drainage ditches
- Elaboration of live barriers
- Construction of infiltration pits
- The use of green fertilizers

A total of 300 farmers received more than one of the trainings described above. The methodology utilized to provide the trainings was thru the training of the link-farmers whom in turn trained all the farmers assigned to their responsibility. The purpose of having the farmer promoters train the rest of the farmers corresponds to the premise that when the project ends the agricultural extension program will be sustainable.

The training of the farmer promoter leaders included additionally the theoretical-practical portion of field visits to other Micro-watersheds that the project served.

D. Training of farmers in organic agriculture

During the period between the 10 to the 13 of September 2002 training on "production of Organic Vegetables" was held. The workshop was directed toward training 20 community leaders called Farmers Promoters and 10 employees of the project micro-watershed management. The course was directed by two technicians from CLUSA who shared their experiences in the matter of organic production

The course had a theoretical component in which the main concepts of organic agriculture were taught, as well as the differences with chemical agriculture. Two of the four days were employed in a practical manner in the identification and control of diseases in vegetables, preparation of organic products like Bocashi fertilizer, foliar fertilizers, vinegars, fungus and plague control products for deceases.

The last day a field visit was held to an organic plot located in the municipality of San Julian, Department of Sonsonate. Finally the parallel organization of CLUSA was visited who is in charge of commercializing the organic products that goes by the name of PROEXAL.

This workshop was performed as a required training before initiating vegetable production in demonstrative plots in the five micro-watersheds covered by the project.

The workshop filled the expectations of the participants that are putting into practice the knowledge learned and are sharing with the rest of the farmers the organic production techniques.

E. Planting of 36,000 pineapple seedlings

A total of 36,000 pineapple seedlings were acquired by the project to be planted in 200 farms of the farmers of the five micro-watersheds. The maintenance of this crop consisted of plague and disease control as well as weed control. Fertilizer was also applied to promote its growth.

The planting of the pineapple has a double purpose; to prevent soil erosion forming a protective barrier that reduces runoff. On the other hand it is a very valued fruit for human consumption so it will become part of the diet of the rural families. The overproduction will be used to generate income for the farmers so

they can explore new production options that can provide a greater return than just planting basic grains.

F. Construction of 16,000 meters of Slope Drainage Ditches

A total of 16,000 meters of slope drainage ditches were built in the plots of the farmers of the project. The ditches are built with the purpose of reducing the superficial runoff of rainwater and thus conserve the soil free of erosion. For the development of this activity the project provided training and technical assistance to the farmers. Each farmer performed his own levels and the constructed his ditches.

G. Construction of 43,000 meters of Live Barriers of Vetiver Grass

During the life of the project a total of 43,000 meters of live barriers of vetiver grass were established in 300 farms. The project provided the vegetation necessary for the establishment of the live barriers. Each farmer was responsible for establishing their own level curves and the planting of the vetiver grass.

A maintenance program for the Vetiver was put in place in such a way to promote the thickening of the plants and improve the degree of protection of the soil.

Vetiver grass is one of the species that offers the best results for erosion control since it has a fibrous system that can grow to the depth of one meter tying the ground solidly. Also its foliage is dense and once it is established it does not permit soil erosion retaining it in such a way that after a year it can form a small terrace. When vetiver grass barriers are combined with the ditches they form a perfect protection for soil erosion.

Photo: A Vetiver grass live barrier in combination with slope drainage ditches

H. Planting of 14,000 citric and other fruit trees

A total of 300 farmers received citric trees to be planted in their plots. The distributed varieties were Persic Lemon, Valencia and Jaffa Orange. Since the beginning of the project 14 thousand citric trees were planted in the micro-watersheds that the project serves.

The purpose of the citric planting was so the farmers would have new economical productive options that would allow them to overcome the poverty level in which they currently live. On the other hand the citric trees constitute a permanent crop that provides vegetable cover for the soil preventing erosion and providing greater water infiltration, which results in a greater quantity of available water.

The planted trees received the following maintenance: weeding, plague and disease control, cutting, fertilizing and the construction of an individual terrace for erosion control in such a way that they could develop appropriately for an optimal production.
Also 4,817 fruit and Nim trees were purchased and planted according to the following detail:

- 582 Avocado Trees

- 300 Cocoa Trees
- 582 Mango Trees Jade variety
- 688 Tangerine Trees
- 560 Banana plants San Andres variety
- 2105 Nim Trees
-

Photo: Planting of Citric trees in Cashagua Micro-watershed

I. Establishment of 80 home gardens

During the reported period work with 80 women was performed in order to establish the same number of home gardens. The gardens were established in the five micro-watersheds served by the project:

The home gardens as its name indicates were built in a plot close to the homes of the benefited families. The crops that were promoted for planting were: tomato, cucumber, radish, sweet peppers and others. The idea of producing in small areas was so people could have a safe supply of vegetables and thus diversify their diet and also save money in the purchase of these.

The project provided the necessary materials for the establishment of the gardens and technical assistance. Each one of the beneficiaries provides the plot and the labor to establish each garden.

We counted with the services of two women specialized in home gardens. They were in charge of guiding the other women on the steps they should follow to establish the gardens.

The gardens produced food to improve the diet of the families and generate additional income for their family economies. This type of experience is of benefit for the communities mainly for the ones that have some sources of water for irrigation since the gardens are a trial ground for crops that can adapt to the area and later be produced on a commercial level.

EVALUATIONS PERFORMED IN THE PROJECT

1. Calculation of the Index of Acceptability

With the purpose of measuring the level of acceptance that the technologies have been spreading in the project of Watersheds in the last years, a research denominated "Calculation of the Index of Acceptability" was carried out. Below we present the results of the research.

Introduction

During the years of 2000 to 2002, World Vision has been carrying out the work of recovering the natural resources of five watersheds located in the municipalities of Jujutla and Guaymango, in the Department of Ahuachapan, El Salvador. The funds of the project were provided by USAID.

The technologies spread through the project are mainly focused to soil and water conservation, reforestation of the watersheds, the diversification of the production and the reduction of the use of agricultural chemicals.

With the purpose of measuring the level of acceptance of the technologies by the farmers, research was carried out using the index of acceptability.

What is the Index of Acceptability?[1]

The Index of Acceptability is a simple follow-up tool for the transference activities. The *ia*[2] permits to learn about the positive effect and the eventual disadvantages of the practices and the

[1] PASOLAC. Index of Acceptability. Introduction of a simple tool for the follow-up of the transference. Managua, Nicaragua. 1999. pp. 8-20

[2] Index of Acceptability

technologies promoted through the referred activities of transference. Also, it provides an idea of the initial acceptance of a practice promoted at the level of the farmers.

Usually the ia is used when the farmers have the first opportunity to implement a technology or practice it after learning about it.

The ia is calculated directly with the farmers that attended the transference process. The total number of inhabitants of a community, zone or watershed is not taken into consideration but rather the farmers directly exposed to the new technology, through field training, trips to the demonstrative plots of land, etc.

The ia is expressed in a formula that integrates the following:

1. The proportion of the farmers that are using the practice after learning it, and

2. The proportion of the area in their farms, where they are applying the practice.

The ia formula is as follows:

Ia = (%of farmers that apply the technology)* (% of the area where they apply the technology) / 100

% of the area where they apply the technology, with the portion of the farm where they are using the new technology. Of course, only the part of the farm where the technology can be applied is taken into consideration.

Application of the Index of Acceptability

The number of farmers served by the project is 300, from which 75 were randomly chosen to define the sample of the research as 25%. The technologies spread in the two and a half years of life of the project are presented below as well as the average area where each technology[3] can be used. The average size of the plots is of 1.06 hectares.

[3] The area to be used varies according to the vocation of the soils of the watersheds and the production needs of the farmers.

Technology	Area where it can be applied (Ha)
1. Drainage ditches for slopes	1.06
2. Plant Barriers of Vetiver grass	0.5
3. Plant Barriers of Pineapple	0.25
4. Plant barriers of Cocoa	0.25
5. Infiltration pit	1.06
6. Organic Fertilizer	0.06
7. Organic Insecticides	1.06
8. Cultivation of Fruit trees	0.25
9. Production of vegetables	0.25
10. Plant fences	1.06
11. Irrigation Systems	0.25

The information was gathered through a previously elaborated survey. Five field technicians were trained to pass the instrument to the farmers. The information provided by the farmers was verified with the field visits to their plots of land.

The charts 1 and 2 show the data used in the calculation of the Index of Acceptability. Also chart 2 in the last column shows the results of the ia for each one of the technologies.

Chart 1. Index of Acceptability of the technologies

Technology	Number of interviewed farmers	Number of farmers applying the practice	Percentage of farmers applying the practice
Drainage Ditches for Slopes	75	68	90.67
Plant Barriers of Vetiver grass	75	74	98.67
Plant Barriers of Pineapple	75	47	62.67
Plant Barriers of Cocoa	75	31	41.33
Infiltration pits	75	40	53.33

Organic Fertilizers	75	41	54.67
Organic Insecticides	75	7	9.33
Cultivation of fruit trees	75	74	98.67
Production of vegetables	75	35	46.67
Plant Fences	75	48	64.00
Irrigation Systems	75	15	20.00

Chart 2: Index of Acceptability of technologies

Technology	Area where the practice is applied (Ha)	Area where the practice could be applied (ha)	Percentage of the area with technology	Index of Acceptability
Drainage ditches for slopes	0.50	1.06	47.17	43
Plant Barriers of Vetiver grass	0.58	0.60	96.67	95
Plant Barriers of Pineapple	0.16	0.20	80.00	50
Plant barriers of Cacao	0.21	0.25	84.00	35
Infiltration Pits	0.14	1.06	13.21	7
Organic Fertilizers	0.05	0.06	83.33	46
Organic Insecticides	0.04	1.06	3.77	0.35
Cultivation of fruit trees	0.13	0.25	52.00	51
Production of vegetables	0.05	0.25	20.00	9
Plant fences	0.83	1.06	78.30	50
Irrigation Systems	0.06	0.25	1.50	0.3

Interpretation of the Information

When the ia was introduced in the follow-up to the early diffusion of the technology some years ago, it was said (Hilderbrand & Poey, 1985) that the percentage of the who accept the technology should be at least 50 and at the same time the total value of ia at least 25. In both cases, the technology should have a good potential of future acceptance.

It is necessary to mention that the first experiences with the ia had to deal more with technologies as seed – genetic material – and chemicals – fertilizers, pesticides – and to a lesser extent; it was about the elements of agronomic management. It can be said that the technologies of soil and water conservation and the integrated management of the plagues are of slower diffusion. Therefore, the critical values of 50 and 25 might be lower. However, there is not enough experience yet.

It is important to state if one of the following two cases was achieved:

1. Very high of the percentage of farmers and very low value of the area.
2. Very low value of percentage of farmers and very high value of the area.

Regarding situation 1, it is about a technology that is accepted by almost everyone, but it is uses in a small scale. It could be due to the cost, or the difficulty to implement it, or the doubt they have about whether it really works, etc.

On the other hand, if situation 2 is present, it could be that the technology is not for everybody, but those who have it consider it useful. Then, it is important to define what the ones that implement the technology have in common.

Analysis of the Results

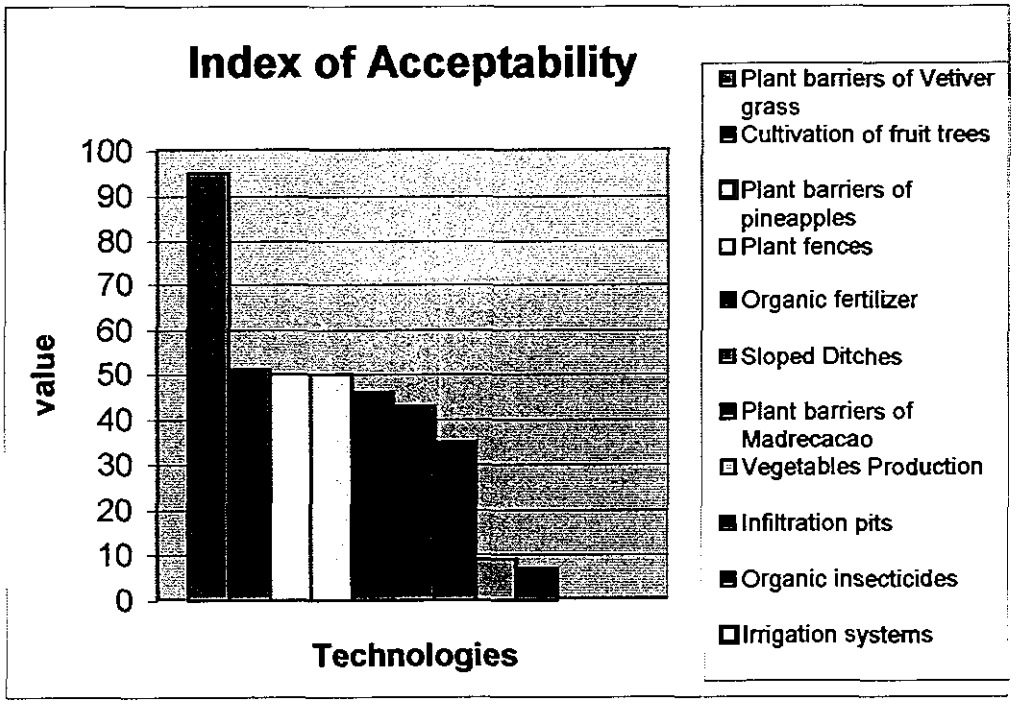
The plant barriers of Vetiver grass, with an ia of 95, constitute the technology with the greatest spread and the highest acceptance. This is because it is the technology that spread the most and had the greatest support. During the 3 years the farmers have received training

about the cultivation methods of grass, besides receiving vegetative material for the cultivation.

In second place the following technologies are found: cultivation of fruit trees with an ia of 50. These technologies have been well received by the farmers since they match their wish to diversify their production through the cultivation of fruit trees, which reach better prices than the cereals. On the other hand it is noticeable that the farmers have a better environmental awareness about the importance of growing forest trees.

In third place the following technologies are found: The organic fertilizers with an ia of 46, drainage ditches for slopes with 43 and plant barriers of Madrecacao with an average of 35. The implementation of these technologies by the farmers is because of their interest to upgrade the soil conditions, which are very deteriorated due to erosion.

The following graphic shows the implemented technologies by the farmers with their respective values of the Index of Acceptability.



Finally, the technologies that have lesser potential to be adopted are: the irrigation systems with an ia of 0.30, the use of organic insecticides with 0.35, infiltration pits with 7 and the production of vegetables with 9. The little acceptability of these technologies is because at least due to 3 factors:

1. The high costs of some technologies such as obtaining the irrigation systems and the production of vegetables.
2. The high physical effort for the construction of infiltration pits. This being the soil and water conservation works with the highest difficulty.
3. The high level of training that the use of organic insecticides and the production of vegetables require.

Something to recall is that more than half of the farmers have elaborated water infiltration pits, but at a small scale. This is due to the previously expressed difficulty that the construction of these works represents. Also, almost half of the farmers are growing vegetables but in small areas. The reason is the high costs and the novelty that these crops represent for the traditional farmers used to the exclusive growing of basic grains.

Conclusions

1. The use of the Index of Acceptability as a follow-up tool is of great utility because it permits to learn about the effectiveness of the effort of training and transference of the technologies promoted with the farmers thus obtaining useful information in order to improve the process of training and acceptability.

2. Generally, it can be said that the results of the application of the Index of Acceptability show that most of the technologies spread through the project of Watershed Management are having acceptance by the farmers.

3. The values of the ia are generally high for the surveyed farmers.

2. Results of the Intermediate Evaluation of the Project

At the end of 2001 an intermediate evaluation was performed whose objectives were focused in analyzing the implementation process and the progress obtained by the project, identify and propose adjustments in the strategies, methods of interventions the level of the farm, micro-watersheds and municipality. Also it intended to provide alternatives for the continuity, sustainability and management in the long term, which would permit an appropriate intervention for micro-watershed management.

Within the main findings of Doctor Jorge Faustino consultant in charge of the evaluation are:

- The spatial approach in relation to size / coverage of territory, shows that the option of achieving positive impact in the handling of micro-watersheds has its advantages, since it will be able to show concentrated and integrated results and it will facilitate a better implementation of activities. The spatial approach is applied in the project that develops the intervention beginning in the highest and farthest portion of the watershed, which reflects that it adjusts itself to the principles of watershed handling.
- The environmental approach that is applied to the project is oriented toward controlling the processes of natural resource degradation taking at its axis the water resource and its interactions with the productive agricultural and livestock system.
- The social approach is one of the more relevant that the project considers since in its operation it integrates the health aspect as it interacts with the water resource. In this context the family is considered the axis of interactions between problems, solutions and actions; it is important to mention here that the gender approach, the participation of women and the role of the organized communities.
- The economic approach that considers that the project has a greater attention in the orientation toward diversification and the development of productive systems expressed in the implementation of the farm plans. This will be a good alternative if it is finally integrated with the commercializing and an organizational capacity that supports this part of the productive chain. Another aspect is the reduction of costs in production as a

result of the soil conservation practices, crop handling and agro forestry.

- In relation to the organizational approach the project bases its operations in the relations with the existing local organizations and institutions and it also considers the farmers (cooperatives and other similar ones).

The integration of all these elements allows considering that the approach for the micro-watershed handling that the project applies is predominantly directed toward contributing with the sustainability of the natural resources in which water is the key resource and actions are in function of the demands of the local actors (farmers and rural families). A complete copy of the evaluation was sent to the USAID office in El Salvador.

LESSONS LEARNED

During the execution of the three years of work the following lessons were learned:

- The approach of integrated handling of Micro-watersheds allows a planning in which the whole watershed is considered as a system achieving a better conservation and use of the natural resources.
- The protection of recharge zones of the aquifers is indispensable to improve the quality and quantity indexes for human consumption.
- Promoting non-traditional crops like the planting of fruit trees along with soil and water conservation works is a way to improve the economic level of the families as well as increasing the protection of the soil and increase the infiltration of water in the aquifers.
- To improve the quality of life for the inhabitants of a micro-watershed is not enough to make a physical protection of the water resources, it is important to accompany the community with actions toward the improvement of their health conditions.
- Providing environmental education to all the members of the community with special emphasis on boys and girls guarantees a change in attitude, behavior and practices of people oriented toward improving their surroundings.
- The extension methodology thru farmer promoters provides an incentive for the participation and empowerment of the local leaders in actions toward the improvement of their own plots.
- The Farm Planning methodology allows the involvement of every farmer in the planning and execution process to improve his property, which in the end will result in benefits for the family and the environment.

Summary Chart For Progress Indicators

Description	Planned 2002	Actual AID1999	Contribution from World Vision
4.1 Rural households in target areas with water that meets quality and time standards	H: 65 F: 65	M: 29 F: 30	
4.2 Rural households nationally with water that meets quality and time standards.	M: 57 F: 57	34	
4.1.1: Area covered by improved practices 1. Soil conservation/reforestation 2. Organic cropping 3. Integrated pest management	1.5,000 2.1,300 3.1,300	1. 4,736 2. 1,479 3. 1,206	1.450 2.200 3.165
4.1.1.1: Farm units utilizing improved practices	5,000	2,067	350
4.1.2.1: Households benefiting from improved solid-waste management	6,535	2,994	225
4.1.2.2: Households benefiting from improved wastewater management	1,666	516	200
4.1.3.1: Industries using pollution prevention practices	8	2	
4.2.1: Water delivery systems that meet flow standards	90	31	2
4.2.1.1: Rehabilitated, expanded and new systems 1. Rehabilitated systems 2. Expanded systems 3. New systems	1. 9 2. 20 3. 63	1. 4 2. 3 3. 18	1. 0 2. 0 3. 2
4.2.2.1: Local organization members and technicians trained	M: 1,200 F: 1,260	M: 796 F: 598	M: 180 F: 180
4.2.2.2: Water system costs covered by collected fees	82	1	2
4.3.1: Water-related changes resulting from citizen-group actions	300	190	4
4.3.1.1: Salvadorans knowing at least one cause and at least one consequence	M: 85 F: 87	M: 65 F: 28	M F
4.3.2.1: Salvadorans knowing at least one solution for unclean water	M: 80 F: 75	M: 64 F: 27	M: F:
4.3.3.1: Organizations working on water-related issues	50	152	12

Description	Planned 2002	Actual- AID- 1999	Contribution from World Vision
4.4.1 Water-related ordinances passed	25	5	-
4.4.2 Resources invested in water-related projects	18	10	-
4.4.1.1 Municipalities with water-resource management plans	11	9	-
4.4.2.1 Municipalities operating their own water systems	11	8	-